Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Electronic and magnetic phenomena at the interface of $LaAlO_3$ and Ru-doped $SrTiO_3$ MATTHEW GRAY, TED SANDERS, Stanford University, CATHERINE JENKINS, PADRIAC SHAFER, ELKE ARENHOLZ, Lawrence Berkeley National Laboratory, YURI SUZUKI, Stanford University — The emergence of a quasi-two dimensional electron gas with hints of magnetic order at the interface between bulk diamagnetic, band gap insulators $LaAlO_3$ (LAO) and $SrTiO_3$ (STO) has led to intensive research of this interface. We doped magnetic, isovalent Ru onto the Ti site of the STO side of the interface. 0-10 nm of $SrTi_{0.98}Ru_{0.02}O_3$ were deposited on TiO_2 terminated (001) STO single-crystal substrates and then capped with 1-17 nm of LAO. Insertion of more than 7 unit cells of Ru-doped STO at the interface suppresses metallic conductivity with a surprisingly sharp metal-insulator transition. A similar metal-insulator transition is observed when a homoepitaxial STO film is grown before LAO deposition. X-ray Magnetic Circular Dichroism indicated no magnetic ordering of Ti down to 10 K, and electric transport was indistinguishable from that of undoped LAO/STO interfaces. Together our results indicate that ferromagnetism is not intrinsic to the interface, magnetic Ru dopants are not significant sources of scattering, and that cation vacancy formation alone cannot explain the insulating behavior observed in thick homoepitaxial LAO/STO/STO trilayers.

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Date submitted: 06 Nov 2015 Electronic form version 1.4